What is the best

"Imaging Method for TOF Detectors"

- High Speed Signal Accumulation and Readout for an Imaging Plate -

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OUR PROPOSAL

"High speed signal accumulation and readout for a neutron imaging plate"

Why do we propose the integration method using an imaging plate?:

1. Independence of neutron incident rate
2. Good position discrimination, wide dynamic range, good neutron sensitivity and large detection area

""However""

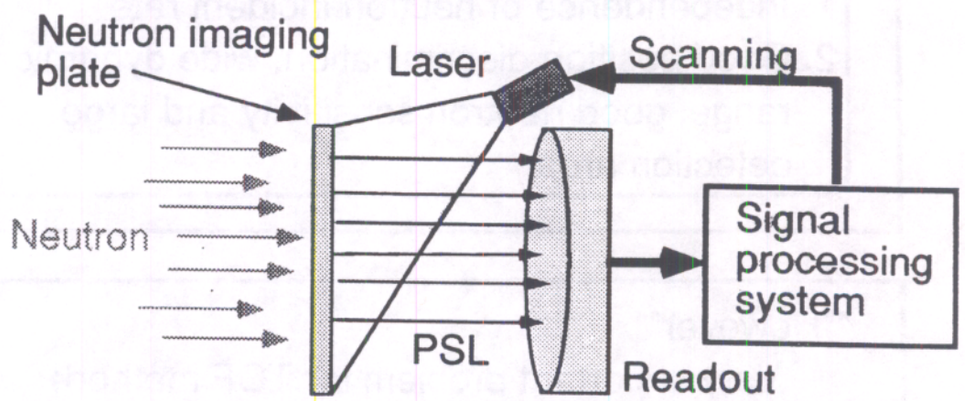
Very important problem for TOF method: no time-resolving ability

Reason: Integration method

How to solve the time-resolving problem

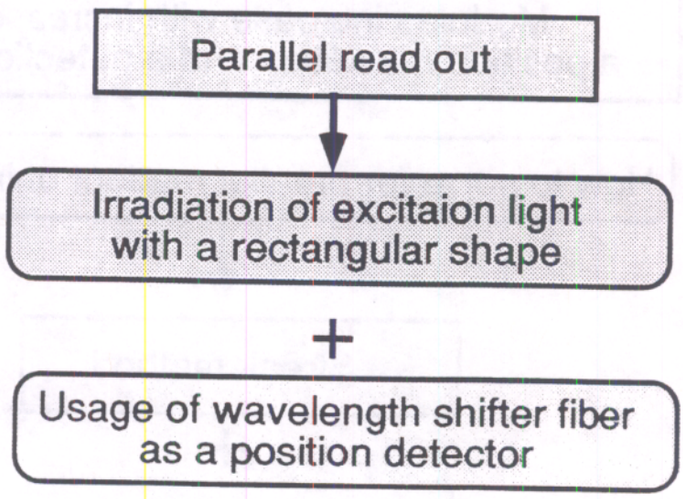
High speed signal accumulation and readout for a neutron imaging plate

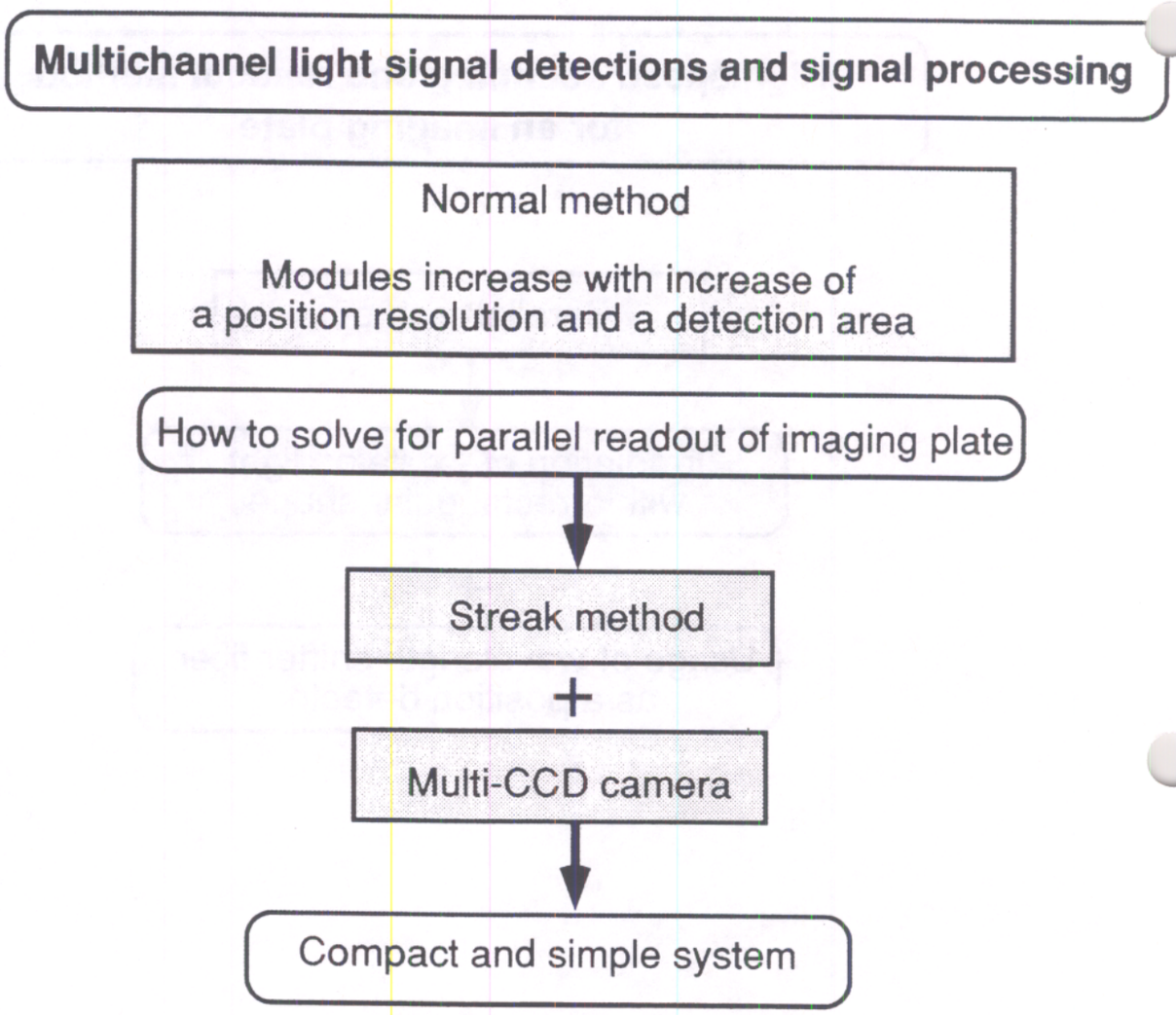
Outline

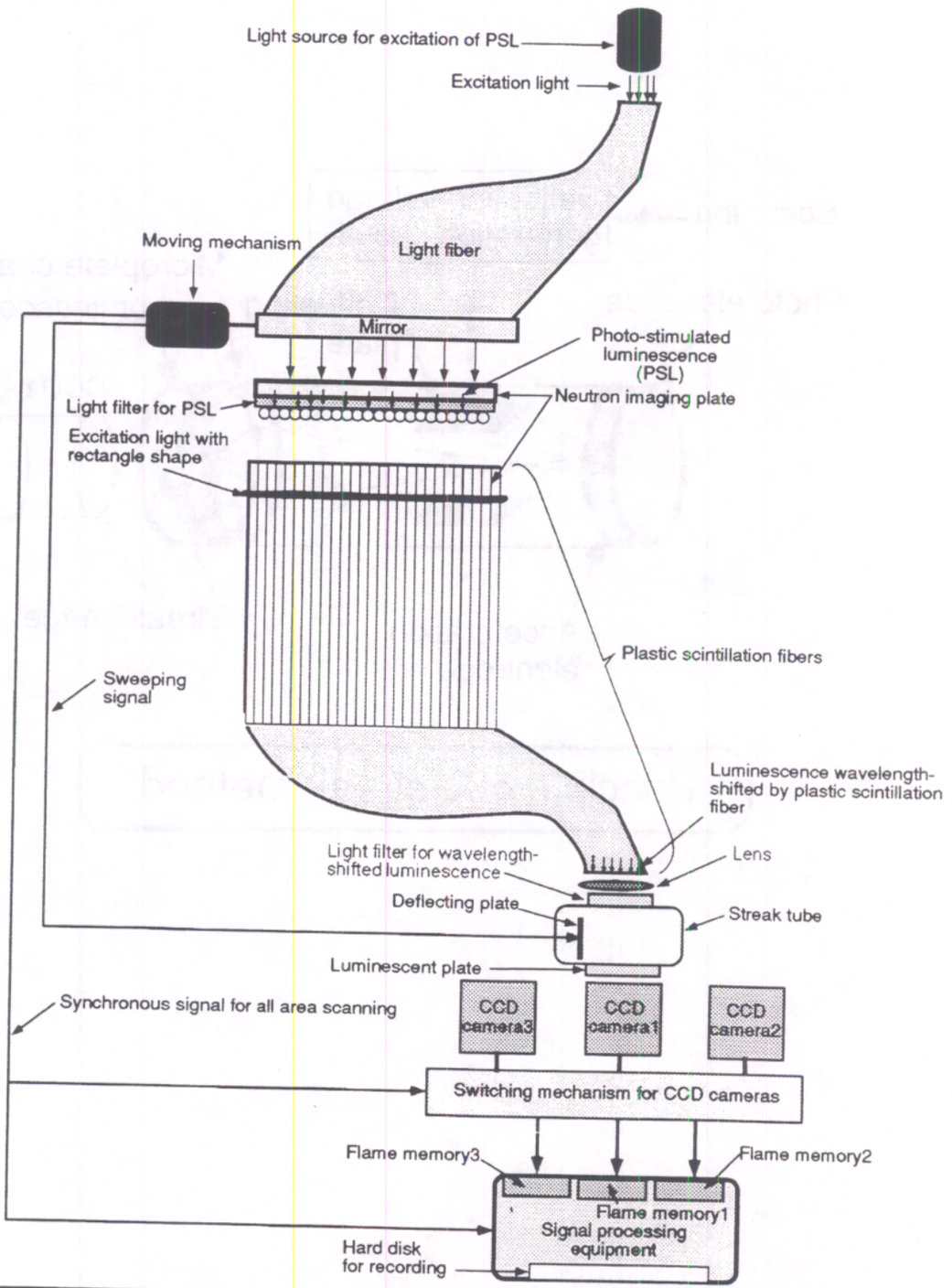


Repeat of high speed scanning and readout with neutron irradiation

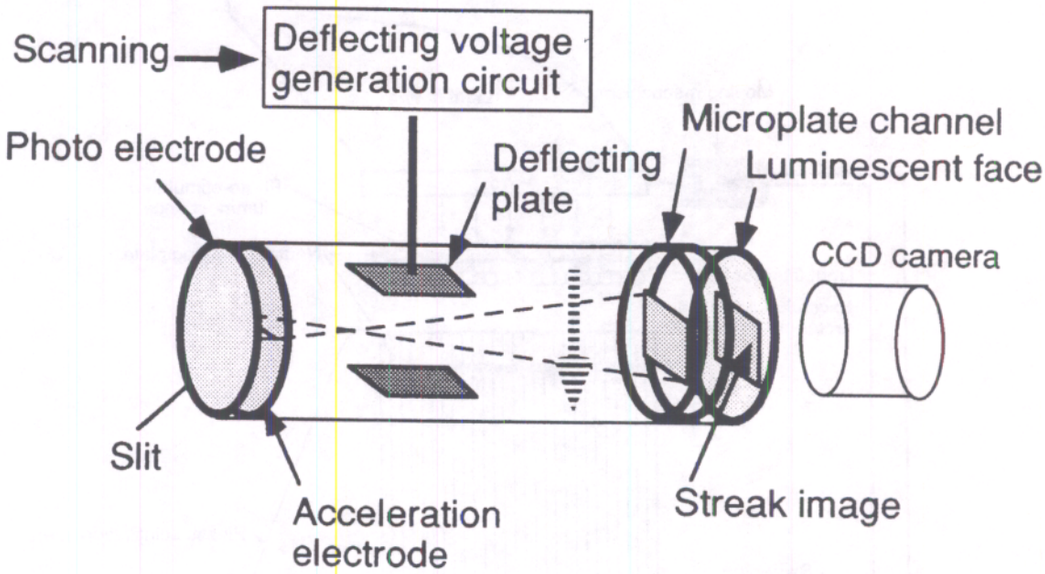
High speed scanning and readout method for an imaging plate




Multichannel light signal detections and signal processing
Normal method
Modules increase with increase of
a position resolution and a detection area
How to solve for parallel readout of imaging plate
Streak method
+
Multi-CCD camera
Compact and simple system



Real time scanning system for spallation neutron sources with a parallel readout method and a streak method



Principle of a streak method

Necessary research and development for realization

1. Full signal readout for one scanning
1) Increase of laser power 2) improvement of readout method 3) New PSL phosphor with short life time

2. Prompt luminescence by neutron
1) New PSL phosphor with few prompt luminescence 2) [redacted] Canceling method

3. [redacted] Sensitivity for gamma-ray
1) New PSL phosphor with low density 2) Canceling method

Estimated performance for prototype system

1. Small-area-type system

Detection area	: 20cm x 20cm
Position resolution	: 0.2mm
Imaging point	: 1000 x 1000
Readout time/line	: 2μs
Scanning speed	: 50m/s
Laser power	: 50W
Readout time for all area (Time resolution)	: 2ms

2. Large-area-type system

Detection area	: 100cm x 100cm
Position resolution	: 1mm
Imaging point	: 1000 x 1000
Readout time/line	: 10μs
Scanning speed	: 250m/s
Laser power	: 250W
Readout time for all area (Time resolution)	: 10ms

Conclusion

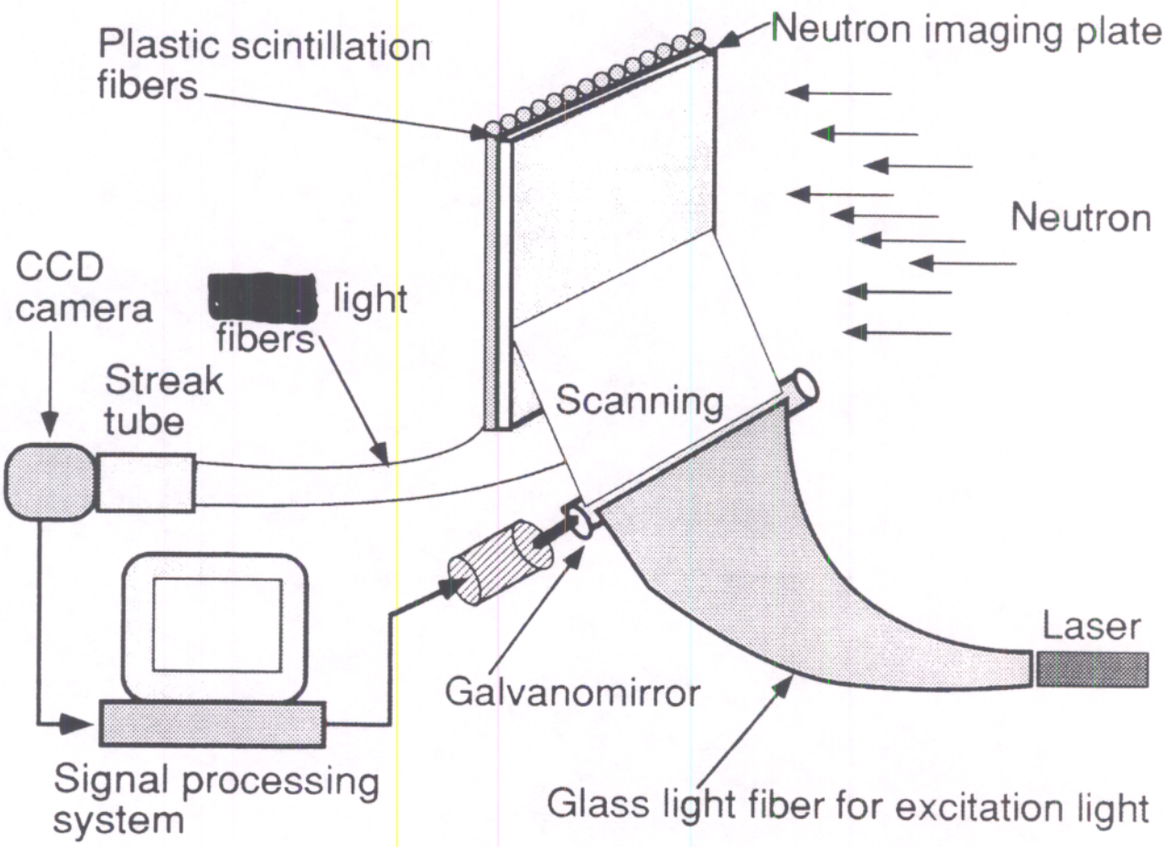


Illustration of real time neutron imaging system using high speed readout method of neutron imaging plate